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Middle School Matters: Examining the Effects of a Schoolwide Professional Development Model to Improve Reading Comprehension

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Abstract

Many middle school students perform below grade-level standards in reading (National Center for Education Statistics, 2019), and recent observation studies demonstrate middle school teachers' limited use of reading comprehension practices within content area instruction (e.g., science and social studies; Greenleaf & Valencia, 2017). In this experimental pilot study, we aimed to boost middle schoolers' reading comprehension outcomes by providing schoolwide professional development (PD) on integrating reading comprehension practices within content instruction for English language arts, social studies, and science teachers. Six schools were matched into pairs and randomized to the schoolwide PD or a business-as-usual (BAU) condition. Content area teachers in schools assigned to the PD condition received distributed PD resources to support implementation, and coaching in one reading comprehension practice in the fall (i.e., get the gist) and one in the spring (i.e., asking and answering questions). Contrary to traditional PD, this PD was implemented across three content areas, was narrow in scope but long in duration (one practice per semester), focused on practices that could feasibly be integrated into content area instruction, and included ongoing coaching in content area teams. Students in schools assigned to the PD condition significantly outperformed those in the BaU condition on a measure of main idea generation ($ES = 0.29$) but not on measures of asking and answering questions ($ES = 0.11$) and general reading comprehension ($ES = -0.09$). Findings suggest promise for implementing schoolwide approaches embedded within content area instruction to improve reading comprehension performance for middle school students.

Middle School Matters: Examining the Effects of a Schoolwide Professional Development Model to Improve Reading Comprehension

Despite large-scale efforts to boost reading comprehension, many students perform below a proficient level in reading (National Center for Education Statistics, 2019). The Institute of Education Sciences, through the Reading for Understanding Initiative, invested more than $100 million to improve knowledge about instructional practices associated with improved reading comprehension for students of all grade levels. The focus of the Reading for Understanding Initiative was to address three areas: (a) underlying processes that contribute to reading comprehension, (b) the development and evaluation of intervention and professional development (PD) programs to improve reading comprehension, and (c) the development of reading comprehension assessments (Institute of Education Sciences, n.d.). This effort resulted in an extensive, interdisciplinary, and collaborative network of institutions and scholars working to better understand reading comprehension for different populations of students across content areas (Institute of Education Sciences, 2016). These studies provided many insights about reading comprehension across grade and achievement levels, but all sites expressed challenges with actually improving students' reading comprehension outcomes (e.g., Connor et al., 2018; Goldman et al., 2016; Pearson et al., 2020; Scammacca et al., 2016; Vaughn et al, 2013; Wanzek et al., 2013).

There are several possible explanations for the limited improvement in middle grade students' reading comprehension outcomes. First, the literacy expectations increase in the middle grades. Students learn new content knowledge in multiple ways, including by reading text. Readers' background knowledge may be limited because the content is less familiar, resulting in difficulty making inferences and connections (Goldman et al., 2016). Another possible

explanation is that observation studies have demonstrated middle school teachers' limited

integration of reading comprehension practices within content area reading (Greenleaf &

Valencia, 2017; Swanson et al., 2016). Classes devoted to reading instruction are rare or

nonexistent in middle school, so there may be advantages for content teachers integrating reading

comprehension instruction into their teaching routines. However, many teachers assume that

middle school students have the necessary skills to comprehend grade-level text and thus do not

embed reading comprehension practices when using reading selections (Boardman et al., 2015;

Swanson et al., 2015). Finally, many content area teachers (i.e., social studies and science) do not

use text reading as a vehicle for teaching content (Murray et al., 2021; Swanson et al., 2016);

instead, teachers use other instructional delivery formats (e.g., lecture). When teachers use text

reading, they may provide key information orally to students so that students bypass reading the

text altogether (Greenleaf & Valencia, 2017). This approach results in limited practice

opportunities for students to engage with text and to develop advanced literacy skills.

The Need for Ongoing, Collective, and Supportive PD on Reading Comprehension

Practices

Content area teachers rarely receive PD focused on improving reading comprehension

(Shanahan & Shanahan, 2008; Swanson et al., 2016), but when they do, it is infrequently

research based, ongoing, contextualized, or deep (Brownell et al., 2009; Garet et al., 2001; Grant

et al., 1996). Thus, PD programs fall short and do not always produce reading gains for students,

especially those with reading difficulties (Garet et al., 2008).

Many challenges are associated with traditional PD models. First, these models typically

include a one-time workshop, which usually occurs outside the school day (Garet et al., 2001).

This type of PD is often ineffective because it is disconnected from the classroom, the duration is

not sufficient to facilitate change in teachers' practice, it does not allow for collective

participation among groups at the same school, and it lacks ongoing coaching and support for

teachers to hone their use of the practice over time (Darling-Hammond et al., 2017; Desimone,

2009; Garet et al., 2001). Findings from the Reading for Understanding Initiative that indicate

that content knowledge is integral to improving comprehension (e.g., Pearson et al., 2020),

coupled with students' persistently poor reading performance, underscore the need for different

PD models. Such models must support middle school content area teachers' effective integration

of reading comprehension practices while teaching content, increasing opportunities for students

to practice reading and learning from text.

Few studies have examined the effects of teacher PD on student outcomes, and most have

been conducted with students in the elementary grades (e.g., Gersten et al., 2010; Simmons et al.,

2010; Swanson et al., 2021). Vaughn and colleagues (2013, 2017) and Vaughn, Roberts,

Swanson et al. (2015) examined the effects of middle school teacher PD on the reading

comprehension and content knowledge outcomes of middle grade students. Teachers learned a

set of instructional practices to improve content knowledge and reading comprehension within

social studies instruction, yielding positive outcomes for students' content knowledge and

reading comprehension. This PD was ongoing in nature (i.e., included an initial workshop and

in-class support throughout implementation), and it focused solely on the integration of effective

comprehension and vocabulary practices within social studies instruction. To build upon this

model and increase students' opportunities to practice reading and learning from text across the

school day, we implemented an alternative, schoolwide approach that (a) provided PD on

implementing reading comprehension practices across content areas (English language arts

[ELA], social studies, and science), (b) included sufficient practice opportunities for students to

read text across the school day, and (c) included instructional practices that are feasible and sustainable for middle school teachers.

Development of the Middle School Matters PD Model

Across 2 years, we developed a schoolwide PD model—the Middle School Matters (MSM) PD model—optimized for helping middle school science, social studies, and ELA educators implement evidence-based reading practices associated with positive academic outcomes for middle grades students. During the first year, we worked collaboratively with sixth- through eighth-grade science, social studies, and ELA teachers to develop instructional materials for embedding evidence-based reading practices into content area instruction. Our work was informed by Desimone's 2009 framework and Garet et al.'s (2001) components of effective PD. The model was *embedded* within teachers' existing school settings, occurred during content area professional learning committees (PLCs) to allow for *collective learning and reflection*, and provided *ongoing coaching and support* for the duration of the school year.

We purposefully selected high-impact instructional practices that were easy to embed within existing lessons using content area texts and that didn't require teachers to overhaul their content delivery. We started with PD and implementation of get the gist (Klingner et al., 1998) to generate main ideas in the beginning of the academic year and then added asking and answering questions in the middle of the year (Palincsar & Brown, 1984; Rosenblatt, 1978). The rationale for using one practice per semester was that we wanted teachers to have adequate time to acquire proficiency with one practice before introducing the second practice. We selected get the gist and asking and answering questions because these practices are theoretically grounded and associated with improved reading comprehension outcomes for adolescent readers (e.g.., Goldman, 2012; Kamil et al., 2008; Palincsar & Brown, 1984; Rosenblatt, 1978; Stevens et al.,

2019; Vaughn et al., 2011). Additionally, these practices can be integrated in teachers' existing instruction and used across a variety of content-area texts. Both practices promote active engagement during reading, support monitoring for meaning, and provide opportunities for students to think critically and integrate information across sections of text. We discuss these practices in more detail in the Method section.

The MSM PD model consisted of the following components:

- Attend a half-day training to learn the reading comprehension practice and plan initial modeling of the practice in content area, grade-level teams

- Observe an MSM coach teach a model lesson in a science, social studies, or ELA class

- Participate in bimonthly PLCs with an MSM coach to reflect on the implementation of the practice, identify challenges, problem-solve collectively to address those challenges, and set goals for future implementation and use of the practice

During the second year, the model was implemented throughout the fall semester for get the gist and again in the spring for asking and answering questions. Researchers collected feedback from teachers as they implemented the two comprehension practices to determine feasibility and usefulness of the model and refined the model as necessary.

The Current Study: Testing the Effects of the MSM PD Model

Given the lack of prior experimental research on the MSM PD model, we conducted an experimental pilot study in six middle schools, examining the effects of the teachers' participation in PD on students' reading comprehension outcomes. We asked the following research questions: (1) Do students in schools where teachers participated in MSM PD significantly outperform those in business-as-usual (BAU) schools on a main idea measure? (2) Do students in schools where teachers participated in MSM PD significantly outperform those in

BaU schools on a measure of asking and answering questions? (3) Do students in schools where

teachers participated in MSM PD significantly outperform those in BaU schools on a measure of

general reading comprehension?

Method

We conducted a pilot cluster-randomized trial (CRT) during the 2019–2020 school year

in six near-urban middle schools from two southwestern U.S. school districts. We randomly

assigned schools to the treatment condition (i.e., MSM PD; $n = 3$) or the BaU condition ($n = 3$).

Randomization occurred at the school level because the MSM PD is designed to be delivered

schoolwide across all core content areas (i.e., ELA, science, and social studies). Because no prior

experimental research on the MSM PD model existed, an adequately powered CRT was cost

prohibitive due to the number of schools needed. Promising results from this pilot study would

support the need for a fully powered efficacy study in the future. Prior to randomization, we

matched the six schools into pairs to improve the likelihood of a balanced randomization with

baseline equivalence on all pretest measures. We paired the schools based on the available

school-level information on variables likely to affect baseline equivalence for reading

comprehension: percentage of English learners; percentage of economically disadvantaged; and

percentage of students who *mastered* grade-level standards, *met* grade-level standards, or

approached grade-level standards on the state-mandated reading assessment from the prior

school year.

In MSM PD and BaU schools, all teachers who taught the same content area had the

same content coverage expectations and standards. Treatment classes differed only in the

integration of the reading comprehension practices targeted in the MSM PD (i.e., main idea

generation and asking and answering questions). Thus, the focus of this study was the delivery of

these reading comprehension practices embedded within teachers' existing content area instruction and materials; we did not provide teachers with content area curricula, texts, or lessons to be used throughout the study other than the initial model lesson.

Participants

Table 1 provides the demographic data for the six participating schools.

Teachers

All ELA, science, and social studies teachers at participating schools were eligible to participate. Per our Institutional Review Board approval, teachers received an explanation of the study and were invited to participate. A total of 131 teachers (100%) consented to participate in the MSM PD ($n = 72$) and BaU ($n = 59$) schools (Table 2). MSM PD teachers received a $150 stipend in the fall and spring semesters for completing surveys, attending PD sessions, and planning for implementation of the practices. BaU teachers received $50 stipends in the fall and spring semesters for completing the project surveys. A subset of teachers at each school (MSM PD and BaU conditions) were recruited to assist with collecting consent forms and administering student assessments three times per year; these teachers received an additional stipend of $100 per semester.

Students

The participating teachers taught sixth-, seventh-, and eighth-grade students in ELA, science, and social studies classes. All students ($N = 4,699$), regardless of consent status, received instruction from their core ELA, science, and social studies teachers. Data were collected only from students for whom we obtained parent consent and student assent ($N = 1,952$; 42%).

MSM PD Model

Initial PD Workshop

During district-provided in-service days in August 2019, science, social studies, and ELA

teachers at MSM PD schools participated in a 3-hour initial PD workshop on implementing get

the gist with content area texts. Teachers received a second PD workshop focused on asking and

answering questions in January 2020, after get the gist was (presumably) well-integrated in

teachers' classrooms. Specifically, the PD included a brief overview of the study; a description

of the research design; an explanation of each instructional practice, how to implement the target

practice within content area instruction, and approaches to providing ongoing practice

opportunities for students; a model introductory lesson showing teachers how to teach the

practice; an explanation of data collection procedures; and facilitated planning time with content

area teams to plan model lessons connected to relevant content topics and content area texts. A

member of the research team (i.e., a Ph.D.-level researcher) led individual PD workshops for

each MSM PD school but used the same materials and agenda so all participants received the

same information. We recorded the PD workshops for those teachers unable to attend the

sessions live; as such, all participating teachers received the initial PD training for both practices.

Reading Comprehension Practices

Get the Gist. Main idea generation (the target practice for the fall PD) is identified as an

effective practice for supporting students' reading comprehension (Goldman, 2012; Kamil et al.,

2008; Stevens et al., 2019). Informed by the construction integration model of comprehension

processing (Kinstch, 1988), get the gist is a paraphrasing process that supports students with

developing a coherent situation model by reading initially brief sections of text, identifying the

most important information, and integrating that information with previously processed main

ideas to develop a deeper understanding of the text (Klingner et al., 1998). Students stop at

predetermined points during reading and use a three-step process to write their gist (main idea):
(1) Who or what is this section about? (2) What is the most important information about the
"who" or "what"? and (3) Combine the information from steps 1 and 2 to write the gist. Students
record their gists on learning logs.

Asking and Answering Questions. Questioning (the target practice for the spring PD),
rooted in reader-response theory and reciprocal teaching (Palincsar & Brown, 1984; Rosenblatt,
1978), is a reading comprehension practice that facilitates active engagement with text,
comprehension monitoring, and literal and inferential comprehension. During reading, students
pause to write questions about important information in the text and answer those questions,
citing textual evidence. Students generate two types of questions (i.e., specific and wide) and
record the questions, answers, and evidence on question logs. Specific questions can be answered
in one word or sentence; wide questions can be answered using information from (a) multiple
places in the text, (b) the text and the reader's prior knowledge, or (c) the text and another text
(Stevens, Murray et al., 2020). This practice helps students think about what is being
communicated and how information relates across paragraphs.

PD Materials

Researchers provided materials, customized for each content area, to all participating
teachers to support the PD and implementation of the research-based practices. In addition to
paper copies, teachers received links to private webpages containing electronic versions of all
materials. Researchers ensured the materials' usability and feasibility by conducting focus
groups with middle school science, social studies, and ELA teachers during the PD model
development phase.

Practice Guides. As part of the initial PD, researchers provided participants with practice guides. The guide provided a description of the research base for the practice, implementation steps, sample model lessons for each content area (see next section), and frequently asked questions.

Sample Model Lessons. Participating teachers received sample model lessons, which included a content area text notated with example language for thinking aloud while modeling the practice with that text. The lesson packet also included an "answer key" (acceptable gists for each text; sample questions, answers, and textual evidence for each text) and a student copy of the text. These samples helped researchers explain and demonstrate how to introduce each practice and model its use with students. Teachers could use the sample lesson to deliver their initial model lesson in their classroom or as an "exemplar" from which to develop their own model lesson using a different text.

Teacher and Student Materials. Participants received physical copies of all materials needed to implement the two practices. Specifically, teachers received classroom posters, student cue cards listing the steps for each practice, get the gist learning logs, and question logs.

Ongoing Coaching, Collective Learning, and Reflection

As a follow-up to PD, MSM coaches provided ongoing coaching during brief PLC meetings (i.e., 15-min) every 2 weeks to help teachers refine implementation of the reading practices. MSM coaches conducted PLC meetings via Zoom or in person using the following: (1) Share experiences using the practice, (2) brainstorm solutions to potential implementation challenges, and (3) set goals for using the practice during the upcoming two weeks.

Implementation

As mentioned previously, the study was conducted during the 2019-2020 school year in which schools closed due to the COVID-19 pandemic. Access to schools and study implementation was not impacted by the pandemic because, by design, we completed the spring PD, implementation, and ongoing coaching sessions before school closures occurred. However, we were unable to collect posttest data on the asking and answering questions subtest for the seventh graders at one school (See the Missing Data section for further explanation). We asked participating teachers to provide main idea instruction for 10 weeks during the fall semester and questioning instruction for 9 weeks during the spring semester. During Week 1, following the initial PD, teachers observed the MSM coach deliver a get the gist lesson in teachers' classrooms across content areas. The lesson modeled how to (a) set a purpose for learning (i.e., reasons using get the gist is important and helpful), (b) introduce get the gist, and (c) demonstrate get the gist with a text while thinking aloud. Debriefing occurred after the lessons so that teachers could ask follow-up questions. During Week 2, teachers delivered their own get the gist model lesson to students. Beginning in Week 3, teachers were asked to provide at least two practice opportunities using get the gist each week. Teachers did not receive scripted lessons or specific texts to use when teaching these practices; researchers asked teachers to integrate the practice within their existing content area instruction twice per week, meaning a given middle school student would have at least six opportunities weekly to practice main idea generation across social studies, science, and ELA classes. To support teachers with embedding the practice within their own lessons rather than relying on scripted lessons, we provided teachers with a "menu" of practice activities. For example, science teachers might ask students to write gist statements at points during a science lab that focus on the hypothesis, procedures, and results of the experiment.

Teachers participated in a similar PD and implementation schedule with asking and answering

questions in the spring semester.

MSM PD Ratings for the Initial Workshop

All teachers who attended the initial PD workshops rated the quality of the PD. Teachers

rated their understanding of the practice, preparedness to implement the practice, willingness to

implement the practice, and campus and district support from 1 to 4, with 1 being *strongly*

disagree and 4 being *strongly agree*. Table 3 presents the results of the PD ratings for each

practice. Teachers rated the PD positively (*M* range 3.49 to 3.68 for get the gist and 3.32 to 3.55

for questioning), indicating they had a high level of understanding of the practice, willingness to

use the practice, and district/campus support.

Fidelity of Implementation for Get the Gist and Asking and Answering Questions

Researchers collected implementation fidelity data from MSM PD teachers via an online

survey every 2 weeks. During initial PD, researchers provided teachers with implementation

goals (i.e., dosage) for using get the gist or questioning during each cycle (i.e., 2-week

implementation period). Teachers reported the number of times they implemented the practice

during each cycle via the online survey. The dosage fidelity data and implementation goals for

each cycle are presented in Table 4. Overall, teachers reported implementing get the gist between

1.62 and 3.05 times, on average, during each cycle, and a range of 39.7% to 95.6% of teachers

met the dosage goal per cycle across the semester. For each content area, ELA and Science

teachers reported using the practice similarly across cycles 2 to 5, but social studies teachers

reported using the practice the most (*M* range 3.05 to 3.33). Teachers reported implementing

asking and answering questions, on average, between 2.33 and 3.01 times per cycle, and a range

of 39.7% to 95.6% of teachers met the dosage goal per cycle. For each content area, science

teachers reported using the practice the least, followed by ELA teachers. Social studies teachers reported using the practice more than science and ELA teachers across most of the cycles.

In addition to dosage data, MSM PD and BaU teachers completed a self-report survey about their use of the get the gist and asking and answering questions *last year* (prior to implementation of the MSM PD model) and *currently* (after implementation of the MSM PD model). Teachers completed the get the gist self-report survey at the end of the 10-week implementation window in the fall semester and the asking and answering questions self-report survey at the end of the 8-week implementation window in the spring semester. For each survey, teachers rated their use of the instructional practice the previous year versus currently on a scale of 1 to 5, with 1 being *never*, 2 being *rarely*, 3 being *occasionally*, 4 being *often*, and 5 being *routinely*.

Table 5 presents the results of teachers' use of the practices prior to and after the MSM PD model for MSM PD and BaU schools. In the prior school year, MSM PD teachers reported using get the gist rarely ($M = 2.25$, $SD = 1.32$), and BaU teachers reported using get the gist occasionally ($M = 2.86$, $SD = 1.38$). After implementation, the MSM PD teachers reported using get the gist often ($M = 3.94$, $SD = 0.74$), and BaU teachers reported occasional use of the practice ($M = 3.07$, $SD = 1.31$). MSM PD ($M = 2.99$, $SD = 1.24$) and BaU ($M = 3.18$, $SD = 1.10$) teachers reported having students generate and answer questions occasionally in the prior school year. After MSM PD implementation, the MSM PD teachers used asking and answering questions often ($M = 3.97$; $SD = 0.73$), whereas BaU teachers reported occasional use of the practice ($M = 3.45$, $SD = 1.03$).

Social Validity for Get the Gist and Asking and Answering Questions

Researchers collected social validity data from MSM PD teachers via an online survey at the conclusion of fall (get the gist) and spring (asking and answering questions). Teachers rated statements about the usability of the practices, feasibility of the practices, and the impact of the practices on students' reading comprehension. Teachers responded to each statement on a scale of 0 (disagree) to 2 (agree). The social validity data are presented in Table 6. Ratings indicated teachers understood how to use the practice, could easily implement the practices within current instruction, and positively affected students' content-area reading comprehension (M range 1.61 to 1.97).

Measures

Researchers provided teachers with training on procedures for administering measures. MSM PD and BaU teachers administered the following reading comprehension measures to participating students: the Gates-MacGinitie Reading Test reading comprehension subtest (GMRT-RC; MacGinitie et al., 2000) and the Strategy Use Measure – Middle School (SUM-MS; The Meadows Center for Preventing Educational Risk, 2019). Teachers administered the GMRT-RC at the beginning and end of the school year. Teachers administered the SUM-MS in August (pretest for get the gist), January (posttest for get the gist; pretest for asking and answering questions), and March (posttest for asking and answering questions).

GMRT-RC (4th Edition)

The GMRT-RC is a group-administered, 35-minute assessment of generalized reading comprehension. Students silently read expository and narrative passages that vary in length and answer three to six multiple-choice questions immediately after reading each passage. Reliability estimates for the subtest range from .91 to .93 for internal consistency and .80 to .87 for alternate forms. Students were administered Form S at pretest and Form T at posttest.

SUM-MS

The research team adapted the elementary-grade version of the SUM (The Meadows

Center for Preventing Educational Risk, 2008) for use with middle school students. The SUM-

MS contained two subtests assessing students' application of two reading comprehension

practices: main idea generation and asking and answering questions. For the main idea

generation subtest, students read three leveled passages containing social studies, science, and

ELA content and then wrote a main idea statement for each passage. Lexile levels for the

passages ranged from 810 to 1,200. The subtest was administered in approximately 20 minutes

for a total of 18 possible points. Each main idea statement was scored from 0 to 6 points, with 2

points awarded for the correct "who" or "what" (e.g., railroads) and 4 points awarded for key

components in the most important idea about the "who" or "what" (e.g., improved transportation

and the economy in the United States).

For the asking and answering questions subtest, students read three passages and

answered multiple-choice items that assessed students' understanding of specific (literal) and

wide (inferential) questions and answers specific to each passage. The passages included

narrative and expository texts that addressed grade-level science and social studies topics. Lexile

levels ranged from 810 to 1,000. Although the test was not timed, administration took

approximately 20 minutes. One point was awarded for each correct answer to the multiple-choice

questions, for a total possible score of 20 points.

Data Analysis

In this experimental pilot study, six schools were matched into pairs and randomly

assigned within pairs to the MSM PD or BaU condition. As a result, student data were nested at

the school level and cross-classified at the teacher level (because students' schedules differed in

the teachers' classes to which they were assigned for social studies, science, and ELA). We acknowledge the nested and cross-classified nature of the student data but did not model it in our analyses. The small number of schools that participated would not provide sufficient power for examining our research questions in the context of a multilevel, cross-classified model. Additionally, the purpose of the study was to determine whether MSM PD demonstrated promise as a means of improving reading comprehension in middle school students. If it did show promise, funding an efficacy study that is fully powered to examine effects in an appropriate multilevel model would be warranted. Therefore, to address our research questions, analysis of covariance (ANCOVA) models were estimated for each student outcome. The pretest for each outcome was included as a covariate. Student-level effect sizes and the associated standard errors were calculated using the formula for Hedges' *g*.

Results

Following a description of the missingness of data from our sample, we present the results of the small-scale experimental study of MSM PD by research question. Descriptive statistics across all measures and research questions are presented in Table 7.

Missing Data

The time required to score the SUM-MS and the large number of students involved in the study made it prohibitive to score all protocols. Therefore, we selected a stratified random sample of 780 students from the 1,777 students who responded to the SUM-MS main idea generation subtest at both the beginning of the year and middle of the year. The sample was stratified on school and grade level to ensure that a balanced sample was selected. As a result, no students were missing scores on the main idea generation subtest and missing data for the students whose protocols were not sampled were missing by design.

It was our intention to score the SUM-MS asking and answering questions subtest for the same sample of 780 students. However, at one middle school the end-of-year data collection for the asking and answering questions subtest was not completed for seventh-grade students before the school closure for COVID-19 mitigation. To preserve our sample size and have adequate representation of seventh-grade students, additional seventh-graders were randomly selected from the remaining sample across the other participating schools. The middle school that did not collect end-of-year data for seventh-grade students was the smallest of the schools that participated in the study. Therefore, to ensure that scores from a sufficient number of students from this school were included, all of the SUM-MS protocols for students in grades 6 and 8 at this school were scored. Additionally, across all participating schools, 14.9% of students in the stratified random sample who responded at the middle-of-year time point did not complete the end-of-year asking and answering questions subtest. These data were missing due to these students being absent on the day the test was administered or having transferred out of the school. As a result, we considered these data to be missing at random and students with missing data were not included in the analyses of the SUM-MS scores.

GMRT-RC protocols were machine scored, allowing us to include all students in the analysis of outcomes. Pretest scores were missing for 6.1% of the total sample of students, with 4.3% missing from the BaU schools and 7.1% missing from the MSM PD schools. Posttest scores were missing for 16.3% of these students, with 17.8% missing from BaU schools and 15.7% missing from MSM PD schools. Missing data on the GMRT-RC were due to student absences on the day of testing or students transferring into or out of the participating middle schools. We considered the missing data on the GMRT-RC to be missing at random. Students with missing data were listwise deleted from the analyses.

Baseline Equivalence

Before analyzing posttest data to address our research questions, Hedges' *g* effect sizes

for pretest scores from students in each condition were calculated to determine whether the

groups were equivalent at baseline. Using criteria from the What Works Clearinghouse, baseline

equivalence was defined as an effect size below 0.25. For the SUM-MS, the effect size for the

difference between groups at pretest favored students in the MSM PD condition on the main idea

generation subtest ($g = 0.05$; *SE* = .07) and the asking and answering questions subtest ($g = 0.11$;

SE = .07). For the GMRT-RC, the effect size for the difference between groups at pretest favored

students in the BaU condition ($g = -0.11$; *SE* = .05). In addition to being below the 0.25 criteria,

none of the effect sizes for pretest scores differed significantly from 0. Therefore, we determined

that the groups were equivalent at baseline and included the pretest scores as covariates in the

analytical models to adjust for the small pretest differences.

Main Idea Performance

For Research Question 1, we asked whether students in schools where teachers

participated in MSM PD significantly outperformed those in BaU schools on a main idea

measure. To address this research question, posttest scores from the SUM-MS main idea

generation subtest were analyzed in an ANCOVA model where pretest scores were included as a

covariate. Results indicated that students in schools where teachers participated in MSM PD

scored significantly higher at posttest than students in schools where teachers did not participate

in MSM PD, $F(1, 777) = 15.78$, $p < .001$. The effect size for the difference in posttest scores was

0.29 (*SE* = .07; 95% CI = [0.15, 0.43]).

Asking and Answering Questions Performance

For Research Question 2, we asked whether students in schools whose teachers participated in MSM PD significantly outperformed those in BaU schools on an asking and answering questions measure. Posttest scores from the SUM-MS asking and answering questions subtest were analyzed in an ANCOVA model with pretest scores as a covariate. There was no statistically significant difference between students in schools where teachers did and did not participate in MSM PD, $F(1, 744) = 0.13$, $p = .72$. The effect size was small and did not differ significantly from 0, $g = 0.11$ ($SE = .07$; 95% CI = [-0.03, 0.25]).

General Reading Comprehension Performance

For Research Question 3, we asked whether students in schools whose teachers participated in MSM PD significantly outperformed those in BaU schools on a measure of general reading comprehension. We addressed this research question by analyzing GMRT-RC posttest extended scale scores in an ANCOVA model with pretest scores used as a covariate. The results showed no statistically significant difference between students in schools where teachers did and did not participate in MSM PD, $F(1, 1,610) = 0.10$, $p = .92$. The effect size for the difference between groups was not significantly different from 0, $g = -0.09$ ($SE = .05$; 95% CI = [-0.19, 0.01]).

<div align="center">**Discussion**</div>

Although most middle school teachers recognize the importance of using effective reading comprehension practices, finding mechanisms for enhancing reading comprehension within the "content-oriented" curriculum of the middle grades is challenging. Our team was interested in supporting middle school teachers with implementing feasible reading comprehension practices associated with improved outcomes across content area learning. With

this in mind, we designed a PD model at the school level that could be implemented within social studies, science, and ELA content instruction.

This study reports the findings from an experimental pilot study testing the effects of this schoolwide PD model on the reading comprehension performance of middle school students. Students in the MSM PD and BaU conditions received the same content area instruction in science, social studies, and ELA. For students in schools assigned to the MSM PD condition, their teachers embedded specific reading comprehension practices (i.e., get the gist and asking and answering questions) during content area instruction. This provided students multiple practice opportunities with each reading comprehension practice across content areas and throughout the semester. The findings demonstrated that students in schools assigned to the MSM PD significantly outperformed students in schools assigned to the BaU condition on a student measure of main idea performance but not on measures of asking and answering questions and general reading comprehension. We interpret these findings as showing initial promise for implementing schoolwide PD to improve the reading comprehension performance of middle school students.

Results from the schoolwide implementation indicated that students in the MSM PD condition demonstrated statistically significant positive outcomes on main idea development (*ES* = 0.29). There are several reasons why we consider this impact promising. First, content area teachers provided all of the comprehension instruction within the context of their own content area instruction. There was no "set-aside time or class" to teach these comprehension practices. Further, classroom teachers provided these comprehension practices without the benefit of scripted lessons or researcher-selected texts. Teachers received PD on the comprehension practices with guidance on how they might be integrated within their existing content instruction

and received ongoing support via coaching throughout the semester. We think this finding is relevant, as it suggests a transfer of learning from the PD to teachers' own teaching routines. It also suggests that students' main idea understanding can be significantly improved with relative ease.

The SUM-MS asking and answering questions subtest assessed students' skill in identifying and answering different question types (i.e., literal and inferential) related to reading and understanding texts. Posttest scores from the SUM-MS asking and answering questions subtest revealed no statistically significant difference between students in schools where teachers did and did not participate in MSM PD ($ES = 0.11$). However, teachers' self-reported use of the practice increased from the previous school year and their reported dosage was greater than that of get the gist. There are several possible explanations for these findings. First, the implementation cycle for asking and answering questions was slightly shorter than for main idea generation (9 versus 10 weeks), meaning students had less exposure and practice opportunities with the various question types. The shortened implementation cycle was due to the need to schedule data collection prior to spring break. It may be that students simply did not have enough practice with asking and answering both question types. Additionally, the asking and answering questions subtest of the SUM-MS contained multiple-choice items, unlike the written responses generated on the main idea subtest. It may be that the multiple-choice format was not sensitive enough to detect improvement in students' questioning understanding. Future research of the MSM PD model might include an open-ended assessment of asking and answering questions; this format may be more sensitive to detecting students' change in questioning understanding.

Finally, we assessed the impact of the MSM PD on students' general reading comprehension performance. There were no statistically significant differences between students

in the MSM PD or BaU condition on the GMRT-RC (*ES* = -0.09). This finding is consistent with

prior PD studies (e.g., Swanson et al., 2021; Vaughn, Roberts, Schnakenberg et al., 2015,

Vaughn, Roberts, Swanson et al., 2015; Vaughn et al., 2017), demonstrating a pattern of null

findings on distal measures of reading comprehension. As has been pointed out in previous

research (Fuchs et al., 2018; Stevens, Vaughn et al., 2020), it may be that the GMRT-RC is a

measure of other constructs (e.g., vocabulary and knowledge) and not apt for measuring

students' growth in main idea generation and questioning. Also, due to the relatively short period

of time between pretesting and posttesting, it may be that there simply wasn't enough time for

students' learning of the practices to generalize to their overall reading comprehension skill.

We think that this study shows promise for designing feasible PD in ways that provide

opportunities for teachers to implement comprehension practices within their content area

instruction with potential benefit to students—at least with respect to generating main ideas of

text. Our findings are consistent with prior research examining PD for upper-elementary and

middle school teachers, which resulted in positive student outcomes on proximal measures of

reading comprehension but not distal measures of reading comprehension (Swanson et al., 2021;

Vaughn, Roberts, Schnakenberg et al., 2015, Vaughn, Roberts, Swanson et al., 2015; Vaughn et

al., 2017).

Though the findings from this study align with prior research, the MSM PD model differs

from previous PD models in several important ways that position the findings as promising.

First, in spite of the challenges with improving the reading comprehension of middle grade

readers, the MSM PD model resulted in significant growth in main idea understanding through

PD that was feasible for teachers, narrow in scope (i.e., one reading comprehension practice per

semester), and easy to implement within existing school settings. We recognize the many

demands on middle school teachers, so our intent was to design a PD approach that was feasible

for teachers to apply and also integrate within their instruction. We did not ask middle school

teachers to substantially change their instruction but instead to use one practice several times

each week during content area text reading. Second, the MSM PD model differs from previous

studies in that we provided relatively minimal support to these teachers (e.g., initial PD and

coaching every other week of implementation). The MSM PD model provided teachers with

practices guides to assist with initial understanding of the practice, but teachers were not given

specific texts, lesson plans, or scripted lessons to use during implementation. Third, the MSM

PD is unique in that it was implemented schoolwide, targeting science, social studies, and ELA

teachers versus occurring within one content area (e.g., social studies; Swanson et al., 2021;

Vaughn et al., 2013). This implementation ensured that students had sufficient practice

opportunities with the reading comprehension practices across content areas, across text types,

and throughout the school week.

Limitations and Implications for Future Research

We collected implementation fidelity data via dosage and self-report surveys. In the

dosage survey, teachers reported how often they used the practice during a two-week time period

(Table 4). In the self-report survey, teachers reported how often they used the practice last year

versus in the current year (Table 5). In the latter survey, teachers rated their usage on a scale of 1

to 5, with 1 being never and 5 being routinely. We recognize the limitations to collecting

implementation fidelity data using self-report measures and conducting observations would have

been preferable; however, we were unable to do so for several reasons. First, it was not feasible

to conduct classroom observations, given the large number of teachers in this study. Second, we

did not collect audio recordings because teachers had the flexibility to integrate the practices

within their existing instruction, rather than using researcher-provided, scripted lessons on specific days or at specific times. As a result, coding audio-recording data was not feasible because it would require the research staff to sift through hours of audio recordings to locate teachers' use of the target practice. In addition, we felt that asking teachers to audio record their use of the practice once or twice per week would not be successful, as teachers would likely forget to turn on their devices, resulting in missing data. We recognize social desirability may have influenced teachers' responses, but we also position our findings and the implementation fidelity data within the context of an experimental pilot study; our aim was to examine the MSM PD model for initial promise. In future studies examining schoolwide PD models across content areas, it would be important for researchers to collect more extensive implementation fidelity data using in-person observations. In addition, observations would provide useful information on how teachers implement the practices within each content area (i.e., number of practice opportunities, gradual release of responsibility, type of texts used, frequency and quality of teacher feedback). This information would be useful in making additional changes, as needed, to the MSM PD model to address teachers' needs based on the information gleaned from the observations.

A second limitation of this initial experimental study of the MSM PD was that while the sample of student participants was quite large, the sample of schools was only 6. We were unable to analyze the data in a way that reflected that students were nested in schools and cross-classified across content area teachers, which is a limitation of our findings. Given that MSM PD students outperformed BaU students on the measure of main idea, a full-scale CRT is warranted with a larger sample of schools to allow the data to be modeled as nested and cross-classified with sufficient statistical power. The estimates of effect size for both practices from the present

study can be used in a future power analysis to determine the number of schools, teachers, and students that would be required for a fully powered efficacy study.

Conclusion

In the introduction of this paper, we described the large-scale efforts and extensive funding invested to improve reading for understanding and the challenges with improving students' reading comprehension outcomes (e.g., Connor et al., 2018; Goldman et al., 2016; Pearson et al., 2020; Scammacca et al., 2016; Vaughn et al., 2013; Wanzek et al., 2013). These findings warrant alternative, schoolwide approaches that suggest promise to move the needle for middle schoolers' reading comprehension outcomes. This study indicates that schoolwide, targeted, and ongoing PD woven into content area instruction may hold promise for improving text comprehension (i.e., main idea generation) of middle grade students. The impact of this study might be considered much more promising in light of the feasibility for teachers, especially because many teachers resist "layering practices" onto what they are already doing. We are interested in further pursuing the extent to which schoolwide approaches to improving reading comprehension might be integrated into content area instruction in ways that could be associated with meaningful impact for students.

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Table 1

School Demographic Data for the 2019–2020 School Year

	Middle School Matters Professional Development			Business as usual		
	School A %	School B %	School C %	School D %	School E %	School F %
Female	48.5	50.6	49.1	48.9	47.3	48.7
Male	51.5	49.4	50.9	51.1	52.7	51.3
African American	12.5	3.1	3.8	3.0	1.6	1.5
Hispanic	33.2	77.4	68.0	49.9	35.6	89.2
White	41.0	16.0	24.1	40.3	59.3	8.1
Asian/Pacific Islander	5.7	1.2	1.2	1.6	0.8	0.3
Other	7.3	2.0	2.8	5.1	2.7	0.9
ED	20.1	59.1	53.8	33.6	11.6	80.4
English learners	4.3	28.1	12.7	6.1	1.4	44.2
Special education	8.3	9.6	14.0	11.5	10.9	12.6

Note. ED = economically disadvantaged.

Table 2

Teacher Demographic Data

Background characteristic	MSM PD (*n* = 72)		Business as usual (*n* = 59)	
	n	%	*n*	%
District				
District 1	44	61	59	100
District 2	28	39	0	0
Ethnicity				
Anglo	50	69	40	68
African American	3	4	3	5
Hispanic	12	17	13	22
Two or more races	2	3	2	3
NR	4	6	1	2
Asian	1	1	0	0
Gender				
Female	46	64	42	71
Male	23	32	17	29
NR	3	4	0	0
Primary language				
English	70	97	59	100
Spanish	1	1	0	0
NR	1	1	0	0
Secondary language				
English	1	1	0	0
Spanish	6	8	9	15
Other	2	3	0	0
Grade level taught				
Sixth	20	28	17	29
Seventh	24	33	15	25
Eighth	20	28	13	22
Mix	8	11	14	24
Content area taught				
English/language arts	27	38	21	36
Science	22	31	18	31
Social studies/history	23	32	18	31
Mix	0	0	2	3
Highest degree earned				
Bachelor's	45	63	35	59
Some master's-level work	11	15	4	7
Master's or higher	16	22	20	34
Years teaching experience				
M	9.6		9.5	
Median	8		7	
Range	0–29		0–32	

Note. MSM = Middle School Matters; PD = professional development; NR = not reported.

Table 3

Professional Development Ratings

Item	Get the gist PD M (SD)	Asking and answering questions PD M (SD)
The PD strengthened my understanding of how to implement the practice.	3.49 (0.61)	3.32 (0.47)
I am able to use the practice for improving reading comprehension as a result of this PD.	3.56 (0.58)	3.38 (0.52)
The instructional practices and lesson materials presented in the PD can be implemented in my classroom.	3.62 (0.57)	3.44 (0.50)
I am willing to use the instructional practices and materials in my classroom.	3.65 (0.56)	3.44 (0.50)
My campus and district support the use of the instructional practices presented in the PD.	3.68 (0.58)	3.55 (0.50)

Note. PD = professional development. Teachers rated the quality and usefulness of each practice after the PD sessions, with 1 being *strongly disagree*, 2 being *disagree*, 3 being *agree*, and 4 being *strongly agree*.

Table 4

Fidelity of Implementation (Dosage) for Get the Gist and Asking and Answering Questions

Reading practice	Cycle 1 (Weeks 1–2)	Cycle 2 (Weeks 3–4)	Cycle 3 (Weeks 5–6)	Cycle 4 (Weeks 7–8)	Cycle 5 (Weeks 9–10[a])
Get the gist					
Target dosage	2	4	4	4	4
Reported dosage[b] M (SD)					
All teachers	1.62 (1.32)	2.89 (1.31)	2.97 (1.49)	2.86 (1.21)	3.05 (1.36)
ELA teachers	2.12 (1.58)	2.58 (1.10)	2.77 (1.48)	2.73 (1.22)	2.81 (1.33)
SS teachers	1.24 (0.89)	3.33 (1.56)	3.05 (1.40)	3.19 (1.40)	3.05 (1.39)
Sci teachers	1.38 (1.20)	2.76 (1.18)	2.95 (1.69)	2.57 (0.98)	3.19 (1.47)
Teachers who met target dosage n (%)	27 (39.7)	23 (33.8)	22 (32.4)	18 (26.4)	65 (95.6)
Asking and answering questions					
Target dosage	2	4	4	4	2
Reported dosage[b] M (SD)					
All teachers	2.47 (1.84)	2.82 (1.41)	3.01 (1.48)	3.12 (1.40)	2.33 (1.16)
ELA teachers	2.85 (2.24)	3.00 (1.26)	2.96 (1.08)	2.92 (1.06)	2.23 (1.07)
SS teachers	2.70 (1.53)	3.15 (1.87)	3.30 (2.00)	3.45 (1.54)	2.60 (1.23)
Sci teachers	1.81 (1.47)	2.33 (0.97)	2.86 (1.39)	3.05 (1.63)	2.19 (1.21)
Teachers who met target dosage n (%)	44 (64.7)	17 (25.0)	28 (41.2)	27 (39.7)	65 (95.6)

Note. ELA = English language arts; SS = social studies; Sci = science.

[a]Week 10 is not included in Cycle 5 for asking and answering questions because implementation was only 9 weeks.

[b]Number of times teacher reported using the practice.

Table 5

Self-Report Fidelity for Get the Gist and Asking and Answering Questions

Self-report fidelity item	MSM PD teachers M (SD)	BaU teachers M (SD)
Get the gist		
Last school year, during reading, I had students stop and write main idea (or gist) statements using a three-step strategy for sections of text.	2.25 (1.32)	2.86 (1.38)
Currently, during reading, I have students stop and write main idea (or gist) statements using a three-step strategy for sections of text.	3.94 (0.74)	3.07 (1.31)
Asking and answering questions		
Last school year, during reading, I had students stop to generate different types of questions about important information or facts.	2.99 (1.24)	3.18 (1.10)
Currently, during reading, I have students stop to generate different types of questions about important information or facts.	3.97 (0.73)	3.45 (1.03)
Last school year, during reading, I had students answer self-generated questions with evidence from the text.	2.62 (1.13)	2.82 (1.11)
Currently, during reading, I have students answer self-generated questions with evidence from the text.	3.82 (0.73)	3.16 (1.02)

Note. MSM = Middle School Matters; PD = professional development; BaU = business as usual. Teachers reported the use of each practice at two time points, with 1 being *never*, 2 being *rarely*, 3 being *occasionally*, 4 being *often*, and 5 being *routinely*.

Table 6

Social Validity for Get the Gist and Asking and Answering Questions

Social Validity Item	Get the Gist M (SD)	Asking and Answering Questions M (SD)
I understand how to use the practice.	1.97 (0.17)	1.94 (0.29)
The practice is a good way to develop reading comprehension for students in my subject area.	1.84 (0.41)	1.84 (0.48)
The practice could be added easily to my current instruction.	1.84 (0.37)	1.85 (0.40)
The practice is a good fit for the needs of students in my classroom.	1.70 (0.52)	1.72 (0.57)
The practice is easy to use.	1.85 (0.36)	1.81 (0.50)
The practice is a good fit for my teaching style.	1.60 (0.55)	1.60 (0.65)
The time required to implement the practice is manageable.	1.66 (0.57)	1.71 (0.58)
I believe the practice is positively affecting my students' content-area reading comprehension.	1.61 (0.55)	1.69 (0.58)
The addition of the practice has improved my instruction.	1.40 (0.61)	1.53 (0.66)

Note. Treatment teachers rated the social validity of each practice on a scale of 0 to 2, with 0 being *disagree* and 2 being *agree*.

Table 7

Descriptive Statistics by Condition

	Pretest						Posttest					
	Middle School Matters PD			Business as usual			Middle School Matters PD			Business as usual		
	M	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*
SUM-MS main idea generation	7.66	3.42	375	7.48	3.26	405	8.90	3.28	361	7.96	3.10	399
SUM-MS asking and answering Qs	10.12	4.49	473	9.61	4.46	405	11.00	4.92	373	10.50	4.30	375
GMRT-RC extended scale score	509.85	42.23	1,060	514.60	43.37	892	494.57	46.45	969	498.70	48.60	770

Note. PD = professional development; SUM-MS = Strategy Use Measure – Middle School; Qs = questions; GMRT-RC = Gates-MacGinitie Reading Test reading comprehension subtest.